

TWO NEW SPECIES OF *ACARTIA* (COPEPODA, CALANOIDA) FROM
SOUTH AFRICAN ESTUARIES

By

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(With 27 figures and 1 table)

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INTRODUCTION

During studies of the zooplankton of South African estuaries two species of *Acartia* new to science have been found. One species, referable to the subgenus *Acartiella*, is often the numerically dominant copepod in estuaries on the east coast of southern Africa. The other species, of the subgenus *Paracartia*, occurs in estuaries on the east coast of South Africa, usually in smaller numbers although it is abundant occasionally. *Acartiella* and *Paracartia* are here regarded as subgenera (cf. Wellershaus 1969) despite Gurney's (1931: 217) proposal to remove them from *Acartia*. Bowman (1965: 149) pointed out that Steuer's (1915, 1923) primary division into 'Acartiae arostratae' and 'Acartiae rostratae' was unacceptable although his subgenera may be maintained.

DESCRIPTION OF MATERIAL

Acartia (Acartiella) natalensis sp. nov.

Figs 1-12, 24, 25

Material examined

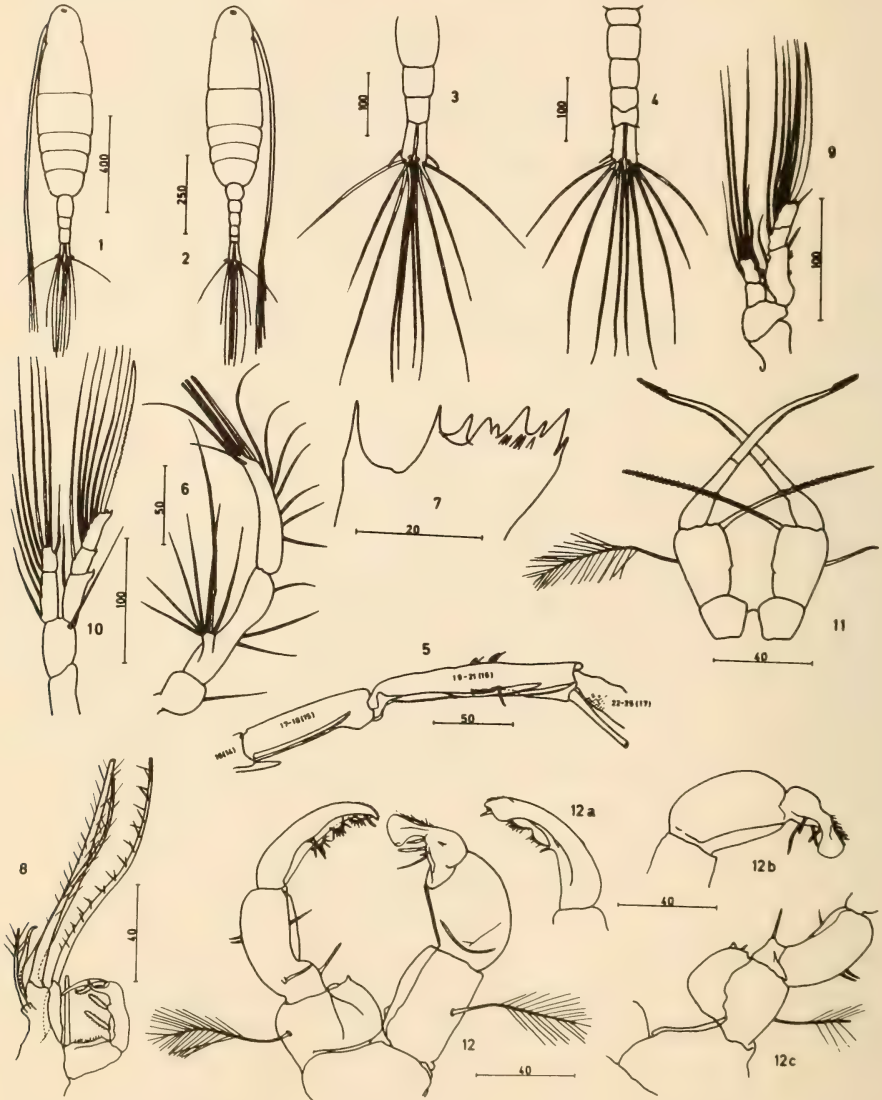
Numerous specimens in samples from estuaries between Knysna (34°S) and the Morrumbene estuary, Mozambique (23°S).

Types

Holotype male (Reg. No. SAM A13408), allotype female (Reg. No. SAM A13409) and paratypes 10♂♂, 10♀♀ (Reg. No. SAM A13410) deposited in the South African Museum, Cape Town, from the Mtentu River estuary (31°14,5'S, 30°2'E) on the Pondoland coast of South Africa.

*Description**Female* (Figs 1, 3, 6-9, 11)

Total length 0,93 to 1,05 mm (Morrumbene specimens were considerably smaller: 0,87 to 0,90 mm, and Knysna specimens were also smaller: 0,82 to



Figs 1-12. *Acartia* (*Acartiella*) *natalensis* sp. nov. 1, female dorsal view; 2, male, dorsal view; 3, female, urosome, dorsal view; 4, same, male; 5, geniculate portion of male right first antenna; 6, female, second antenna; 7, female, mandible; 8, female, maxilliped; 9, first leg, female; 10, male, fourth leg; 11, female, fifth leg; 12, male, fifth leg (posterior view); 12a, 12c, anterior view, right leg; 12b, anterior view, left leg. All measurements in microns.

0,90 mm). The head is slightly produced anteriorly. No rostrum or filaments are present. The postero-lateral corners of the prosome are spineless (Fig. 1). The first antennae reach the posterior end of the furcal rami. Urosome segments are devoid of spines (Fig. 3), but the anal segment usually bears a single transverse row of minute hairs on its dorsal surface. The furcal rami each bear five long plumose setae, four terminal and one dorsal, and a short curved accessory seta laterally about twice as long as ramal width. The furcal rami are asymmetrical, the right being longer.

The first antennae consist of 22 apparent segments, but 'segment' 2 is apparently compounded of 3 segments and 'segment' 4 of 2, giving 25 true segments. Segments 13 to 20 (apparently 10 to 17) have a row of small spines, slightly less in length than the width of the segments. Segment 22 is only fractionally longer than wide.

The second antennae are somewhat atypical for the subgenus, being of the normal *Acartia* form (Fig. 6), and apparently resembling those of *A. (Acartiella) kemp*i (Sewell, 1914), the only other described member of the subgenus with this type of second antenna. The endopod is relatively small. There are no hairs on the inner margin of the exopod. There are slight differences in setation in specimens from different localities.

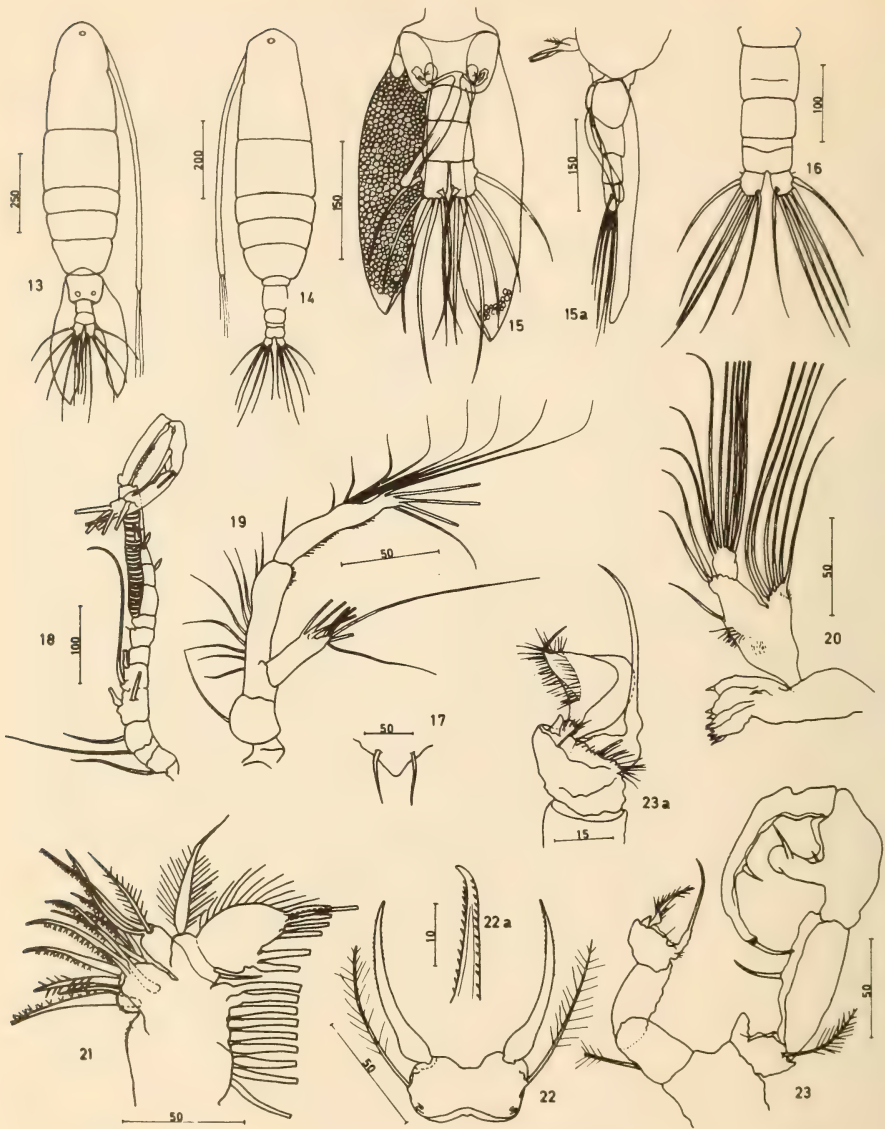
The first maxilla has the base more expanded than in that of *A. (Paracartia) longipatella* sp. nov. (Fig. 21) and lacking the patches of fine setae on the inner margin. There are no hairs on the distal margin of the exopod.

The second maxillae are normal, bearing approximately 15 setae of varying length. The maxillipeds are as figured (Fig. 8) with three strong and two reduced biplumose setae on the basal segment. Specimens from Knysna show these five setae more equally developed. The four pairs of swimming legs are typical of the genus (Table 1). On the first leg the second segment of the exopod, however, lacks the outer marginal spine on its apical angle (Fig. 9), while this spine is present but much reduced on legs 2 to 4. This spine is barely noticeable in legs 2 and 3 in many specimens. Leg 5 is distinctive from that of all other known species of the subgenus *Acartiella*. The exopod is basally about four times thicker than the endopod (Fig. 11), while the endopod is $\frac{3}{4}$ as long as the exopod, bearing short hairs as figured. There is no seta midway on the outer margin of the exopod.

Male (Figs 2, 4, 5, 10, 12, 24, 25)

Total length 0,82–0,88 mm (Morrumbene specimens 0,76–0,79 mm, Knysna specimens 0,73–0,78 mm). General shape is similar to the female although the urosome is longer relative to the prosome length (Fig. 2). The last urosome segment has a couple of small spines, and there are usually two or three on the outer edge of the caudal rami (Fig. 4). Only the left ramus has a short curved accessory seta, while the plumose setae are similar to those of the female.

The first antennae extend to the distal end of the furcal rami. The left antenna is as in the female, while the right has only 17 apparent 'segments',



Figs 13–23. *Acartia* (*Paracartia*) *longipatella* sp. nov. 13, female, dorsal view; 14, male, dorsal view; 15, female, urosome, semi-schematic, showing position of accompanying plates; 15a, same, lateral view; 16, dorsal view male urosome; 17, female, rostrum, and filaments; 18, male, right first antenna; 19, male, second antenna; 20, male, mandible and palp; 21, female, first maxilla; 22, female, fifth leg; 23, male fifth leg, anterior view; 23a, another detailed view of the left fifth leg. All measurements in microns.

TABLE 1

Ornamentation of the swimming legs of *Acartia (Acartiella) natalensis* sp. nov.
Si, Se, St represent internal, external and terminal spines or setae respectively.
The number of setae is shown in arabic numerals and spines in roman numerals.

Leg	Protopod				Endopod					Exopod						
	1		2		1		2			1		2		3		
	Si	Se	Si	Se	Si	Se	Si	St	Se	Si	Se	Si	Se	Si	St	Se
P ₁	0	0	0	0	0	0	2	2	1	1	I	1	0	4	I	I
P ₂	0	0	0	0	2	0	4	2	1	1	I	1	I*	5	I	I
P ₃	0	0	0	0	2	0	4	2	1	1	I	1	I**	5	I	I
P ₄	0	0	0	1	3	0	3	2	1	1	I	1	I**	5	I	I

* much reduced

** reduced

several of them compound. The geniculation is between 'segments' 15 and 16 these being compounds of true segments 17-18 and 19-21 respectively (Fig. 5). Apparent segment 9 bears a short heavy spine, while 10 and 11 are swollen. 'Segments' 14, 15 and 16 bear serrated, sabre-like spines (Fig. 5).

The remaining appendages from the second antenna to leg 4 are as in the female.

The male 5th legs differ markedly from those of other members of the subgenus (Figs 12, 12a, 12b, 12c, 24, 25). The right leg does however form a well-developed clasping apparatus as specified by Sewell (1914) in his definition of the subgenus. The detail of the terminal structures of P5 left segment 2-3 was difficult to determine clearly and was therefore photographed under the scanning electron microscope after critical-point drying (Figs 24, 25).

Occurrence

This species was abundant in most estuaries on the east coast of southern Africa between Knysna and Murrumbene. It was collected in waters of varying salinity from 3.3 to 65‰.

Discussion

Although the shape of the second antenna places this species with *kempi* Sewell, 1914, the male and female 5th legs are unusual and somewhat different from any known species. The key to *Acartiella* species provided by Wellershaus (1969) (from which *A. sinensis* Chia-jui & Foo-siang, 1963 is omitted) easily accommodates *natalensis*, since this species is easily distinguished from *kempi* by the structure of the 5th leg of both male and female.



Figs 24-25. *A. (Acartiella) natalensis* sp. nov. Male fifth leg, left, 1, lateral view, 2, dorsal view (with some debris caught in the setae).



Figs 26-27 *A. (Paracartia) longipatella* sp. nov. Male fifth leg, left, lateral view.

This species is one of the dominant copepods at least as far north as the Morrumbene estuary, suggesting a wider distribution probably extending to estuarine waters of the east African coast. Its presence in South African waters considerably increases the known range of the subgenus *Acartiella*, previously confined to Indian, Burmese and south Chinese coastal and estuarine waters.

Acartia (Paracartia) longipatella sp. nov.

Figs 13–23, 26, 27

Material examined

Many specimens in samples from estuaries from between the Klein River estuary (Hermanus) and St. Lucia (Natal). It was not observed in samples from Mozambique estuaries or from estuaries on the west coast of South Africa.

Types

Holotype male (Reg. No. SAM A13411), allotype female (Reg. No. SAM A13412) and paratypes 10♂♂, 10♀♀ (Reg. No. SAM A13413) deposited in the South African Museum, Cape Town, from the Mtentu River estuary (31°14.5'S, 30°2'E) on the Pondoland coast of South Africa.

Description

Female (Figs 13, 15, 17, 21, 22)

Total length 0,98–1,04 mm (Knysna specimens 0,80–0,88 mm, Breede River specimens 0,82–0,90 mm). The head is slightly produced anteriorly. A rostrum and filaments are present (Fig. 17). The postero-lateral corners of the prosome are rounded (Fig. 13), with the first urosome segment greatly enlarged, the posterior two segments normal (Fig. 15). The caudal rami are short, only slightly longer than wide. Caudal setae are as figured (Fig. 15). On mated females the accompanying plates (Sars 1904) of the spermatophore reach far past the posterior tip of the furcal rami (Fig. 15).

The first antennae reach almost to the posterior end of the first urosome segment (Fig. 13), with 19 recognizable segments. The second antennae are of the normal *Acartia* form, with fine setae on the inner margin of the exopod and second basal segment (Fig. 19). The mandible with its palp is as figured for the male (Fig. 20). The first maxilla is figured (Fig. 21). The second maxilla is typical of the genus, bearing approximately fifteen setae of varying length. The maxilliped is similar to that figured for *A. (Acartiella) natalensis* (Fig. 8), but the second segment is more swollen and has its plumose spine much shorter than that of *A. natalensis*.

The first swimming leg is similar to that of *A. natalensis* (Fig. 9) but has an outer marginal spine on the apical angle of each of the three exopod segments, while segment 3 has, in addition, a median external seta and a short spine near the base of the terminal spine. The setal formula of the inner margin of the

endopod segments is 1:3 compared with 0:2 of *A. natalensis* (Fig. 9 and Table 1). Legs 2-4 are similar to *A. natalensis* (Fig. 10), but a short stout spine is well developed on all 3 segments of the exopod.

The female fifth legs resemble those of other *Paracartia* species, but the outer plumose setae are subequal in length to the exopods (Fig. 22), which are not as strongly curved as those of *P. africana* (Steuer).

Male (Figs 14, 16, 18-20, 23, 26, 27)

Total length 0,82-0,88 mm (Knysna specimens 0,76-0,87 mm, Breede River specimens 0,75-0,79 mm). The head is rather more truncate anteriorly. The last segment of the prosome has rounded postero-lateral corners (Fig. 14). Urosome segments are not greatly enlarged. The furcal rami are no longer than their width. Setae are as illustrated (Fig. 16).

The first antennae reach to the posterior margin of the prosome (Fig. 14). The left antenna is as described for the female, the right is as figured (Fig. 18), and the geniculation is between the fourteenth and fifteenth 'segments', the fourteenth bearing a stout, blunt spine slightly longer than segment length. 'Segments' 9-13 are hollowed anterodorsally.

The appendages from second antenna to fourth leg are as for the female. The right fifth leg is greatly enlarged (Fig. 23), and is typical of males of the subgenus *Paracartia* (see Steuer 1923). The left side is also fairly typical, being somewhat reduced. The terminalia include a long thin spine and a broader plate, setose along one edge (Figs 23, 23a). The line-drawings were confirmed by scanning electron microscope photographs (Figs 26, 27).

Occurrence

This species was present in estuaries between Hermanus (Klein River estuary) and Natal (St. Lucia), usually in small numbers but occasionally abundant. It was obtained in waters of varying salinity from 7-35,5‰.

Discussion

There are only four members of the subgenus previously described and their distribution ranges down the east side of the Atlantic Ocean, with *P. latisetosa* (Kriczagin) penetrating into the Mediterranean and Black Seas. The most northerly species is *P. grani* Sars, from the north-west coast of Europe (Sars 1904), while *P. dubia* Th. Scott has been collected in the Gulf of Guinea and *P. africana* along the South West African coast (Unterüberbacher 1964) and west coast of South Africa (unpublished record).

Acartia asymmetrica Tanaka, 1964, described from the 'Bay of Cape Town' is a synonym of *Acartia* (*Paracartia*) *africana* Steuer.

The occurrence of a member of the subgenus in east coast temperate and subtropical estuaries is thus interesting, and extends the range of the subgenus into the Indian Ocean.

The lack of any form of wing-like projection on the last prosome segment

in the female is distinctive, as is the shape of the first urosome segment and the size and shape of the spermatophore plates, in mature females. The prominence of these long plates gives rise to the name proposed for this species.

Both *Acartia (Acartiella) natalensis* and *Acartia (Paracartia) longipatella* appear to be restricted to estuaries and neither species has been found in the open sea.

SUMMARY

Two new species of *Acartia* are described from estuaries on the east coast of southern Africa. *Acartia (Acartiella) natalensis* occurs in estuaries in South Africa and Mozambique, while *Acartia (Paracartia) longipatella* has only been recorded from estuaries on the east coast of South Africa.

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REFERENCES

- BOWMAN, T. E. 1965. An arostrate population of the copepod *Acartia lilljeborgii* Giesbrecht (Calanoida, Acartiidae), from St. Lucia, West Indies. *Crustaceana* **8**: 149-152.
- CHIA-JUI, S. & FOO-SIANG, L. 1963. The estuarine Copepoda of Chiekong and Zaikong rivers, Kwangtung Province, China. *Acta zool. sin.* **15**: 571-596.
- GURNEY, R. 1931. British fresh-water Copepoda. **1**. *Ray Soc. Publs* **118**: 1-238.
- SARS, G. O. 1904. Description of *Paracartia grani* G. O. Sars, a peculiar calanoid occurring in some of the oysterbeds of western Norway. *Bergens Mus. Arb.* **1904** (4): 1-16.
- SCOTT, T. 1894. Report on the Entomostraca from the Gulf of Guinea. *Trans. Linn. Soc. Lond.* (2) **6**: 1-161.
- SEWELL, R. B. S. 1912. Notes on the surface-living Copepoda of the Bay of Bengal I and II. *Rec. Indian Mus.* **7**: 313-382.
- SEWELL, R. B. S. 1914. Notes on the surface Copepoda of the Gulf of Mannar. *Spolia zeylan.* **9**: 191-263.
- SEWELL, R. B. S. 1919. A preliminary note on some new species of Copepoda. *Rec. Indian Mus.* **16**: 1-18.
- STEUER, A. 1915. Revision der Gattung *Acartia* Dana. *Zool. Anz.* **45**: 392-397.
- STEUER, A. 1923. Bausteine zu einer Monographie der Copepodengattung *Acartia*. *Arb. zool. Inst. Univ. Innsbruck* **1**: 89-147.
- STEUER, A. 1934. Two new copepods of the genus *Acartia* from Burma. *Rec. Indian Mus.* **36**: 335-338.
- TANAKA, O. 1964. Two small collections of copepods from the Antarctic. *Scient. Rep. Jap. Antarct. Res. Exped.* (E) **22**: 1-20.
- UNTERÜBERBACHER, H. K. 1964. Zooplankton studies in waters off Walvis Bay with special reference to the Copepoda. *Investl Rep. mar. Res. Lab. S.W.Afr.* **11**: 3-42.
- WELLERSHAUS, S. 1969. On the taxonomy of planktonic Copepoda in Cochin backwater (a South Indian estuary). *Veröff. Inst. Meeresforsch. Bremerh.* **11**: 245-286.